



INNOLUX DISPLAY CORPORATION

TM315GW11 V.1 LCD MODULE SPECIFICATION

() Preliminary Specification

(●) Final Specification

Customer	Checked and Approved by
SEC	

Checked by	Prepared by
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INNOLUX DISPLAY CORPORATION

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A. General specification

NO.	Item	Specification	Remark
1	Display resolution (pixel)	1,366(H) X 768(V), WXGA+ resolution	
2	Active area (mm)	697.685 (H) X 392.256(V)	
3	Screen size (inch)	31.5 inches diagonal	
4	Pixel pitch (mm)	0.17025 (H) X 0.51075 (V)	
5	Color configuration	R, G, B vertical stripe	
6	Overall dimension (mm)	783.55 (W) X 462.55 (H) X 61.6(D)	
7	Weight (g)	5300	
8	Surface treatment	Anti-glare, Haze=11%, Hard coating (3H)	Note 1
9	Input color signal	8 bit LVDS	
10	Display colors	16.7M	
11	Color saturation	72% NTSC	
12	Backlight	4U CCFL	
13	RoHS & Halogen free	RoHS & Halogen free compliance	

Note 1: Glare Option available

B. Electrical specifications

1. Pin assignment

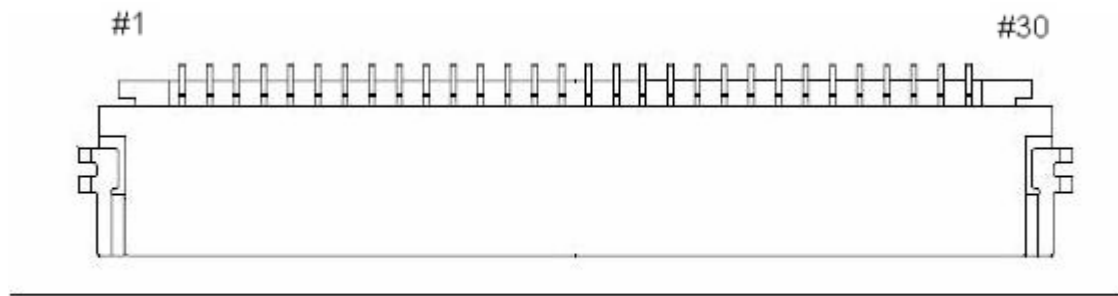
Connector

STARCONN 106F30-000000-A2-R or mechanical interface equivalent connector.

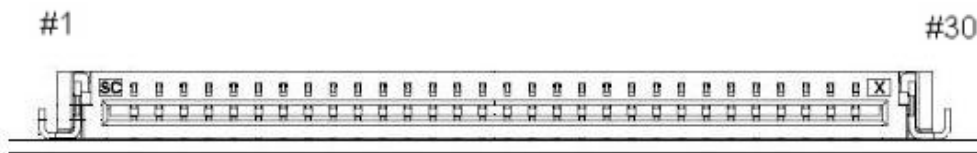
Pin NO	Symbol	Description
1	NC	No connection
2	SCL	EEPROM Serial Clock
3	SDA	EEPROM Serial Data
4	GND	Ground
5	RX0-	LVDS Channel 0 Negative
6	RX0+	LVDS Channel 0 Positive
7	GND	Ground
8	RX1-	LVDS Channel 1 Negative
9	RX1+	LVDS Channel 1 Positive
10	GND	Ground
11	RX2-	LVDS Channel 2 Negative
12	RX2+	LVDS Channel 2 Positive
13	GND	Ground
14	RXCLK-	LVDS Clock Negative
15	RXCLK+	LVDS Clock Positive
16	GND	Ground
17	RX3-	LVDS Channel 3 Negative
18	RX3+	LVDS Channel 3 Positive
19	GND	Ground
20	NC	No connection
21	SELLVDS	Low/Open for JEIDA, High for Normal (NS)
22	WP	EEPROM Write Protection
23	GND	Ground
24	GND	Ground
25	GND	Ground
26	VCC	Power Supply : +12V
27	VCC	Power Supply : +12V
28	VCC	Power Supply : +12V
29	VCC	Power Supply : +12V
30	VCC	Power Supply : +12V

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Top view of LVDS connector



Side view of LVDS connector

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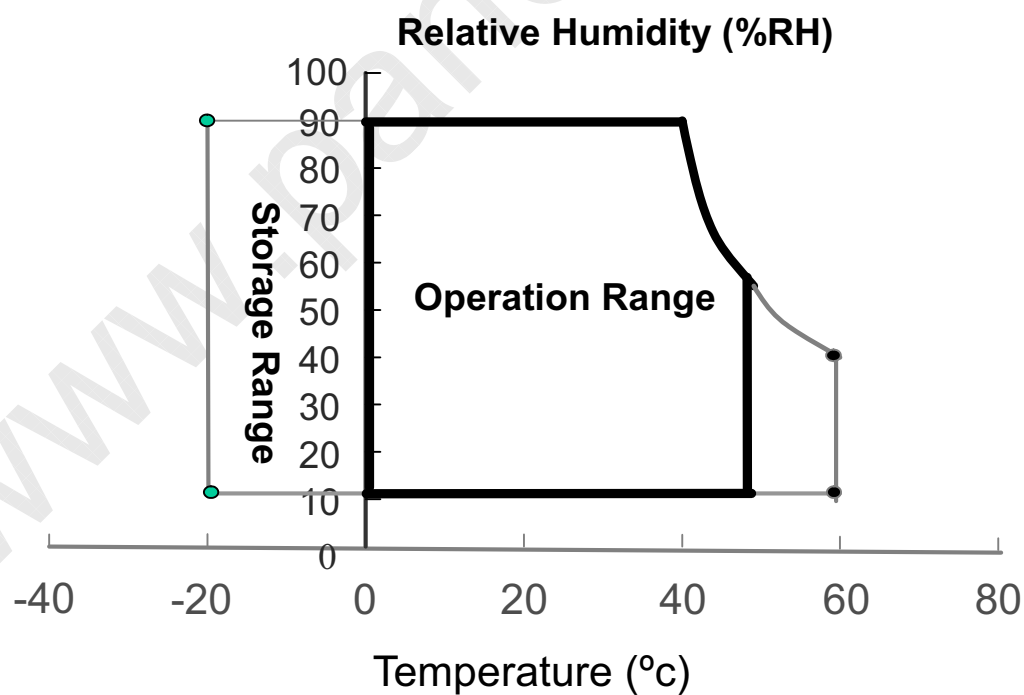
2. Absolute maximum ratings

Parameter	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
LCD drive voltage	V_{CC}	-0.3	-	14.0	V	At 25°C
Input signal voltage	V_{LH}	-0.3	-	3.6	V	At 25°C
BLU Input voltage	VDDDB	-0.3	-	28	V	At 25°C
Operating temperature	Top	0	-	50	°C	Note 1
Operating Humidity	Hop	10	-	90	%RH	
Storage temperature	T_{ST}	-20	-	60	°C	Note 2
Storage Humidity	H_{ST}	10	-	90	%RH	

Note 1: The relative humidity must not exceed 90% non-condensing at temperatures of 40°C or less.

At temperatures greater than 40°C, the wet bulb temperature must not exceed 39°C.

Note 2: The unit should not be exposed to corrosive chemicals.



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3. Electrical characteristics

a. Typical operating conditions

Item		Symbol	Min.	Typ.	Max.	Unit	Remark
LCD Input Voltage		V_{CC}	10.8	12	13.2	V	
LCD Permissive Power Input Ripple		V_{RF}	-	-	0.4	V	
LCD Input Current	Black	I_{CC}	-	300	-	mA	Note 1
	White	I_{CC}	-	450	550		Note 2
	Mosaic	I_{CC}	-	375	-		Note 3
Power Consumption		P_C	-	5.4	7.26	W	Note 2
LCD Rush Current		I_{Rush}	-	-	3	A	Note 4
Logic Input Voltage LVDS: IN+, IN-	Common Mode Voltage	VCM	1.10	1.25	1.40	V	
	Differential Input Voltage	VID	100	-	600	mV	
	Threshold Voltage (High)	VTH	-	-	100	mV	Note 5
	Threshold Voltage (Low)	VTL	-100	-	-	mV	Note 5

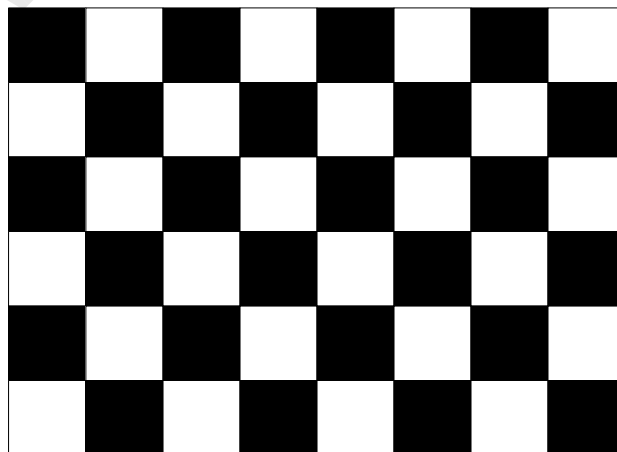
Note 1 : The specified current is under the $V_{CC} = 12V$, $25\text{ }^{\circ}C$, $f_v = 60Hz$ (frame frequency) condition whereas black pattern is displayed.

Note 2 : The specified current is under the $V_{CC} = 12V$, $25\text{ }^{\circ}C$, $f_v = 60Hz$ (frame frequency) condition whereas white pattern is displayed.

Note 3 : The specified current is under the $V_{CC} = 12V$, $25\text{ }^{\circ}C$, $f_v = 60Hz$ (frame frequency) condition whereas mosaic pattern(black & white [8*6]) is displayed.

White : 255 Gray

Black : 0 Gray



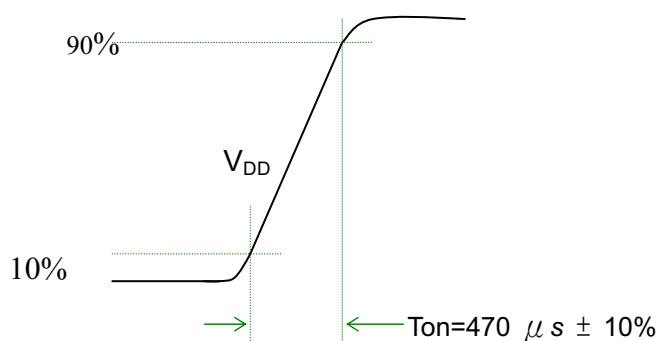
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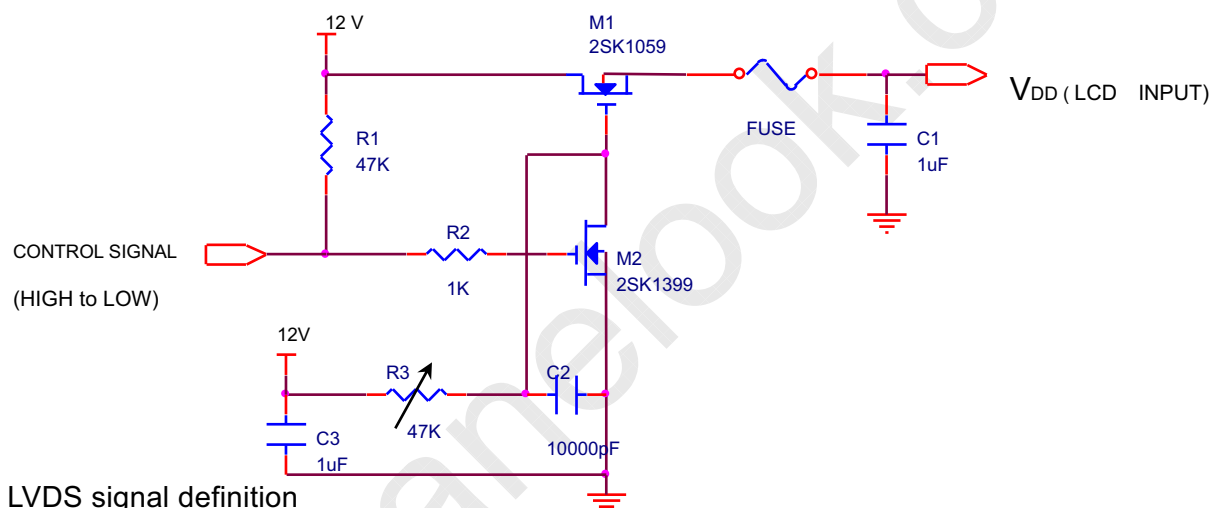
Note 4 : test condition :

(1) $V_{DD} = 12\text{ V}$, V_{DD} rising time = $470\text{ }\mu\text{s} \pm 10\%$

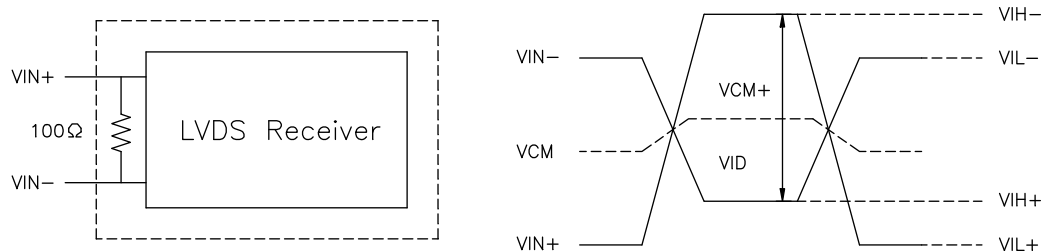
(2) Pattern: Mosaic pattern



(3) Test circuit

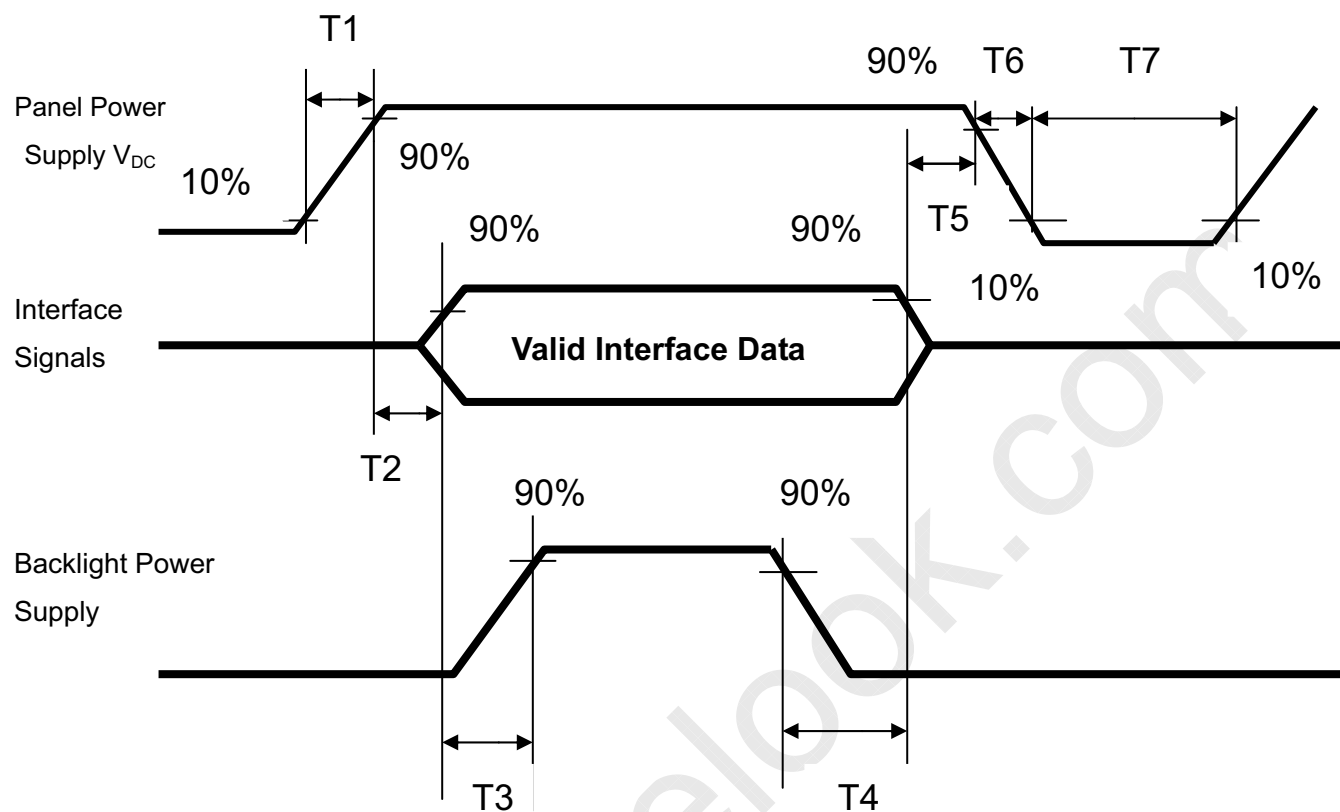


Note 5: LVDS signal definition

 $VIN+$ = Positive differential DATA & CLK Input $VIN-$ = Negative differential DATA & CLK Input $VID = VIN+ - VIN-$, $\Delta VCM = |VCM+ - VCM-|$, $\Delta VID = |VID+ - VID-|$, $VID+ = |VIH+ - VIH-|$, $VID- = |VIL+ - VIL-|$, $VCM = (VIN+ + VIN-)/2$, $VCM+ = (VIH+ + VIH-)/2$, $VCM- = (VIL+ + VIL-)/2$,

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Note 6 : Power on sequence for LCD V_{DD} 

Parameter	Value			Unit
	Min	Typ	Max	
T1	0.1	-	30	ms
T2	0.1	-	50	ms
T3	200	-	-	ms
T4	10	-	-	ms
T5	0.1	-	50	ms
T6		-	300	ms
T7	500	-	-	ms



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b. Display color vs. input data signals

The brightness of each primary color (red, green and blue) is based on the 8-bit gray scale data input for the color; the higher the binary input, the brighter the color. The table below provides a reference for color versus data input.

Color		Input color data																							
		Red								Green								Blue							
		MSB				LSB				MSB				LSB				MSB				LSB			
		R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0
Basic colors	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(255)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green(255)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	Blue(255)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Cyan	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Magenta	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	White	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Red	Red(000) dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(001)	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(002)	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Red(253)	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(254)	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(255) bright	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Green	Green(000)dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green(001)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	Green(002)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Green(253)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0
	Green(254)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
	Green(255)bright	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
Blue	Blue(000) dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Blue(001)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Blue(002)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Blue(253)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1
	Blue(254)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0
	Blue(255) bright	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1

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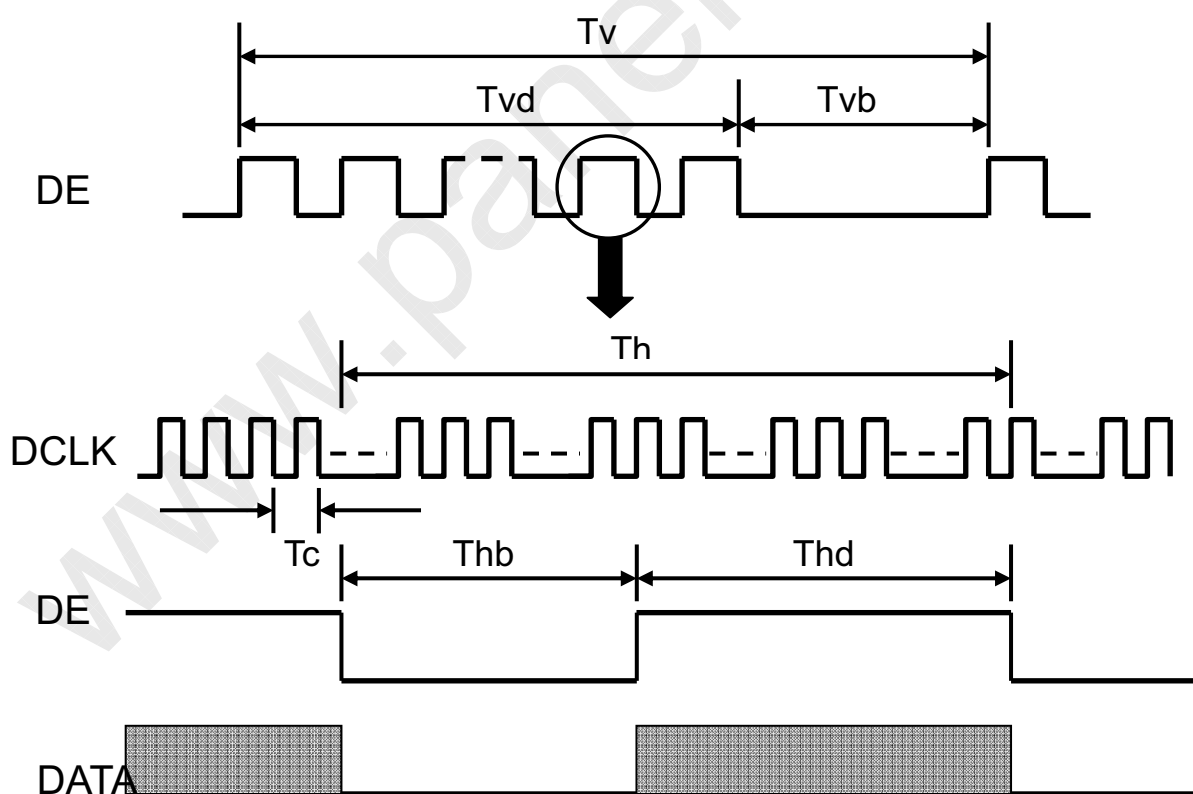
c. Input signal timing

Support Input Timing Table

	Item	Description	Min.	Typ.	Max.	Unit
Clock	Dclk	period	11.63	12.5	16.7	nS
		frequency	60	80	86	MHz
Vertical	T_{V_TOTAL}	V total line number	776	810	1015	T_{H_TOTAL}
	T_{V_DATA}	Data duration	—	768	—	T_{H_TOTAL}
	T_{VB}	V-blank	8	42	247	T_{H_TOTAL}
	f_V	frequency	50	60	63	Hz
Horizontal	T_{H_TOTAL}	H total pixel number	1550	1648	2000	DCIk
	T_{H_DATA}	Data duration	—	1366	—	DCIk
	T_{HB}	H-blank	184	282	634	DCIk

Note: Because this module is operated by DE only mode, Hsync and Vsync input signals should be set to low Logic level or ground. Otherwise, this module would operate abnormally.

INPUT SIGNAL TIMING DIAGRAM



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d. Display Position

D(1, 1)	D(2, 1)		D(683, 1)		D(1365, 1)	D(1366, 1)
D(1, 2)	D(2, 2)		D(683, 2)		D(1365, 2)	D(1366, 2)
⋮			⋮		⋮	⋮
D(1, 384)	D(2, 384)		D(683, 384)		D(1365, 384)	D(1366, 384)
⋮			⋮		⋮	⋮
D(1, 767)	D(2, 767)		D(683, 767)		D(1365, 767)	D(1366, 767)
D(1, 768)	D(2, 768)		D(683, 768)		D(1365, 768)	D(1366, 768)

e. Backlight driving conditions

Electrical specification

(Ta=25℃)

Item	Symbol	Min.	Typ.	Max.	Unit	Remark
Lamp Current	IL	10	12.5	13.0	mArms	Note 1
Lamp Voltage	VL	1525 ± 7% (IL:10.0mA) 1495 ± 7% (IL:11.0mA) 1465 ± 7% (IL:12.0mA) 1445 ± 7% (IL:12.5mA) 1430 ± 7% (IL:13.0mA)			Vrms	Note 2
Lamp Consumption	I _{LTYP}	VL	IL	VL X IL	mArms	Note 3
		1445	12.5	18.06 W		
Established Starting Voltage	Es			2180	Vrms	Note 4
Frequency	Fr	(40)		(60)	KHz	Note 5
		(40)		(80)		Note 6
Gas Pressure		30 ± 5			Torr	
Lamp life time		50,000	-	-	Hr	Note 7

Note 1: Current range that lifetime and reliability can be guaranteed. Current value is equal to GND side.

Note 2: Should be measured after luminance is stabilized at each current state.

Note 3: Typical current for use of lamp.

Note 4: Output voltage of test circuit in order to stabilize in tube. The measuring method is followed.

(1) Lamp and test circuit should be left at the above standard conditions over 1 hour.

(2) Auto Vds mode of test circuit is used.

Ids level: Max (0~10mA peak)

Vds level: Max / Vds speed: level 1(0.6 KV/sec)

Note 5: Frequency range that the change of electric-optical characteristic is under10%. (40-60 KHz)

Note 6: Frequency life time and reliability can be guaranteed. (40-80 KHz)



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Note 7: End of life is defined by following items. Life time test conditions are ambient temperature:

25 ± 5 °C, allowed current range with wind under 0.1m/sec and continuous operation.

- (a) Luminance at the center point decrease by 50%, or
- (b) Discharge stabilization voltage is over the maximum value of Established starting voltage in the initial characteristics,

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C. Optical specifications

Item	Symbol	Condition	Specification			Unit	Remark
			Min.	Typ.	Max.		
G to G Response time	T _γ	θ= 0°	-	8.5	14	ms	Note 2
Contrast ratio	CR	θ= 0°	2300	3000	-		Note 1,3
Viewing angle	Top	CR≥ 10	75	88	-	deg.	Note 1,3,5
	Bottom	CR≥ 10	75	88	-		
	Left	CR≥ 10	70	88	-		
	Right	CR≥ 10	70	88	-		
Brightness (Center)	Y _L		300	350	-	Nits	Note 1,4
Color chromaticity(CIE)	Wx	θ= 0°	-0.03	0.280	+0.03		Note 1
	Wy			0.290			
	Rx			0.634			
	Ry			0.343			
	Gx			0.283			
	Gy			0.610			
	Bx			0.144			
	By			0.062			
White uniformity (9points)	δ _w		0.75	0.80	-		Note 1,6
Cross talk	Ct		-	-	2%		Note 7

Note : 1 Ambient temperature = 25°C.

2 To be measured in dark room after backlight warm up 30 minutes.

Note 1: To be measured with a viewing cone of 2°by Topcon luminance meter BM-5A.

Note 2: Note 2: G to G Response Time:

Response time T_γ is the average time required for display transition by switching the input signal for six luminance ratio (0%,20%,40%,60%,80%,100% brightness matrix) and is based on fv=60Hz to optimize.

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	0%	20%	40%	60%	80%	100%
0%		t0%-20%	t0%-40%	t0%-60%	t0%-80%	t0%-100%
20%	t20%-0%		t20%-40%	t20%-60%	t20%-80%	t20%-100%
40%	t40%-0%	t40%-20%		t40%-60%	t40%-80%	t40%-100%
60%	t60%-0%	t60%-20%	t60%-40%		t60%-80%	t60%-100%
80%	t80%-0%	t80%-20%	t80%-40%	t80%-60%		t80%-100%
100%	t100%-0%	t100%-20%	t100%-40%	t100%-60%	t100%-80%	

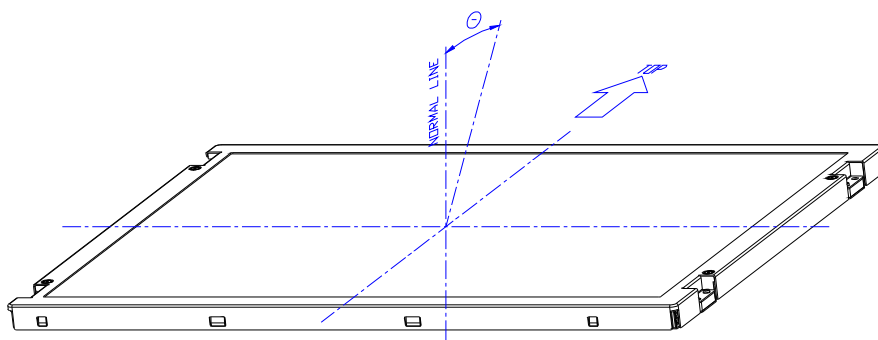
Note 3: Definition of contrast ratio:

Contrast ratio is calculated by the following formula.

$$\text{Contrast ratio (CR)} = \frac{\text{Brightness on the "white" state}}{\text{Brightness on the "black" state}}$$

Note 4: Driving conditions for CCFL: $I_L = 12.5$ mA

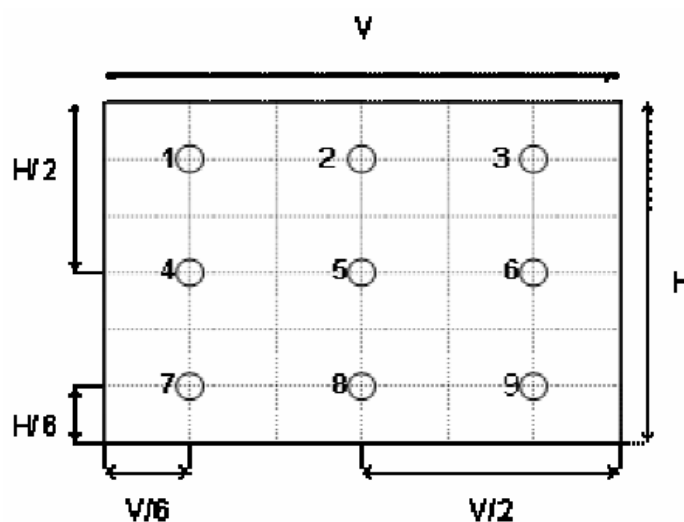
Note 5: Definition of viewing angle.



Note 6: Definition white uniformity:

Luminance are measured at the following nine points (P1~P9).

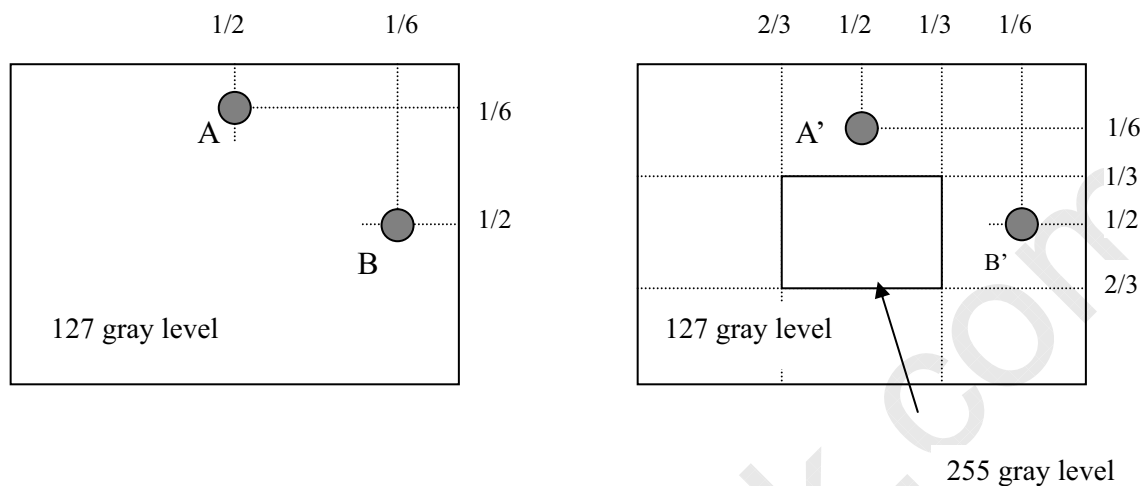
$$\delta_w = \frac{\text{Minimum Brightness of nine points (P1~P9).}}{\text{Maximum Brightness of nine points (P1~P9).}}$$



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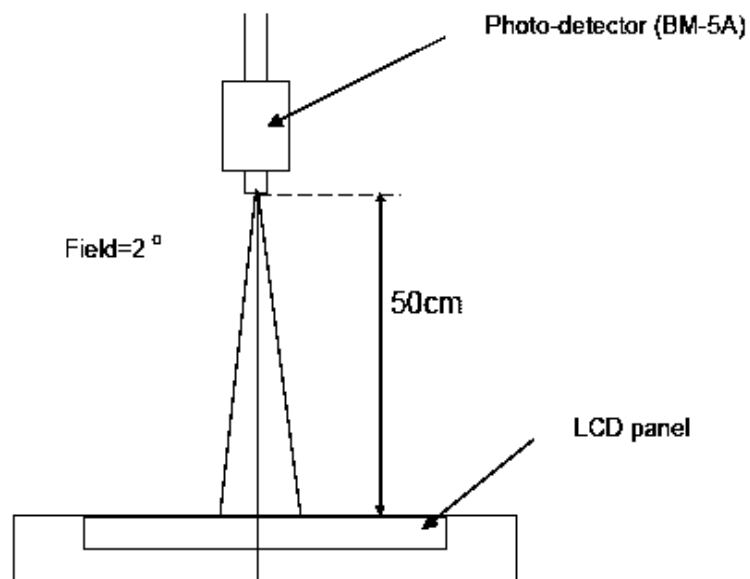
Note 7:



$$|L_A - L_{A'}| / L_A \times 100\% = 2\% \text{ max.}, L_A \text{ and } L_{A'} \text{ are brightness at location A and A'}$$

$$|L_B - L_{B'}| / L_B \times 100\% = 2\% \text{ max.}, L_B \text{ and } L_{B'} \text{ are brightness at location B and B'}$$

Note 10: Optical characteristic measurement setup.



**D. Reliability test items**

Test Item	Test Condition	Judgment	Remark
High temperature storage	60°C, 240Hrs	Note 1	Note 2
Low temperature storage	-20°C, 240Hrs	Note 1	Note 2
High temperature operation	50°C, 240Hrs	Note 1	Note 2
Low temperature operation	0°C, 240Hrs	Note 1	Note 2
Vibration (non-operation)	Vibration level : 1.5G Bandwidth : 10-300Hz Waveform : sine wave, sweep rate : 10min 30 min for each direction X, Y, Z (1.5 Hrs in total)	Note 1	Note 2
Mechanical Shock (non-operation)	Shock level : 50G, 11ms Waveform : Half sine wave Direction : $\pm X$, $\pm Y$, $\pm Z$ One time each direction	Note 1	Note 2
Vibration test (with carton)	Random Wave (1.5 Grms 10~200Hz) 30mins / Per each X.Y.Z axes	Note 1	Note 2
Drop test (with carton)	Height : 38cm 1corner; 3edges; 6 surfaces	Note 1	Note 2
MTBF Demonstration	50,000 hours with confidence level 90%	Note 1	Note 3

Note1: Pass: Normal display image with no obvious non-uniformity and no line defect.

Partial transformation of the module parts should be ignored.

Fail: No display image, obvious non-uniformity, or line defects.

Note2: Evaluation should be tested after storage at room temperature for two hours.

Note 3: The MTBF calculation is based on the assumption that the failure rate distribution meets the Exponential Model (CCFL excluded)

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E. Safety

(1) Sharp Edge Requirements

There will be no sharp edges or corners on the display assembly that could cause injury.

(2) Materials

a. Toxicity

There will be no carcinogenic materials used anywhere in the display module. If toxic materials are used, they will be reviewed and approved by the responsible InnoLux Toxicologist.

b. Flammability

All components including electrical components that do not meet the flammability grade UL94-V1 in the module will complete the flammability rating exception approval process. The printed circuit board will be made from material rated 94-V1 or better. The actual UL flammability rating will be printed on the printed circuit board.

c. Capacitors

If any polarized capacitors are used in the display assembly, provisions will be made to keep them from being inserted backwards.

F. Display quality

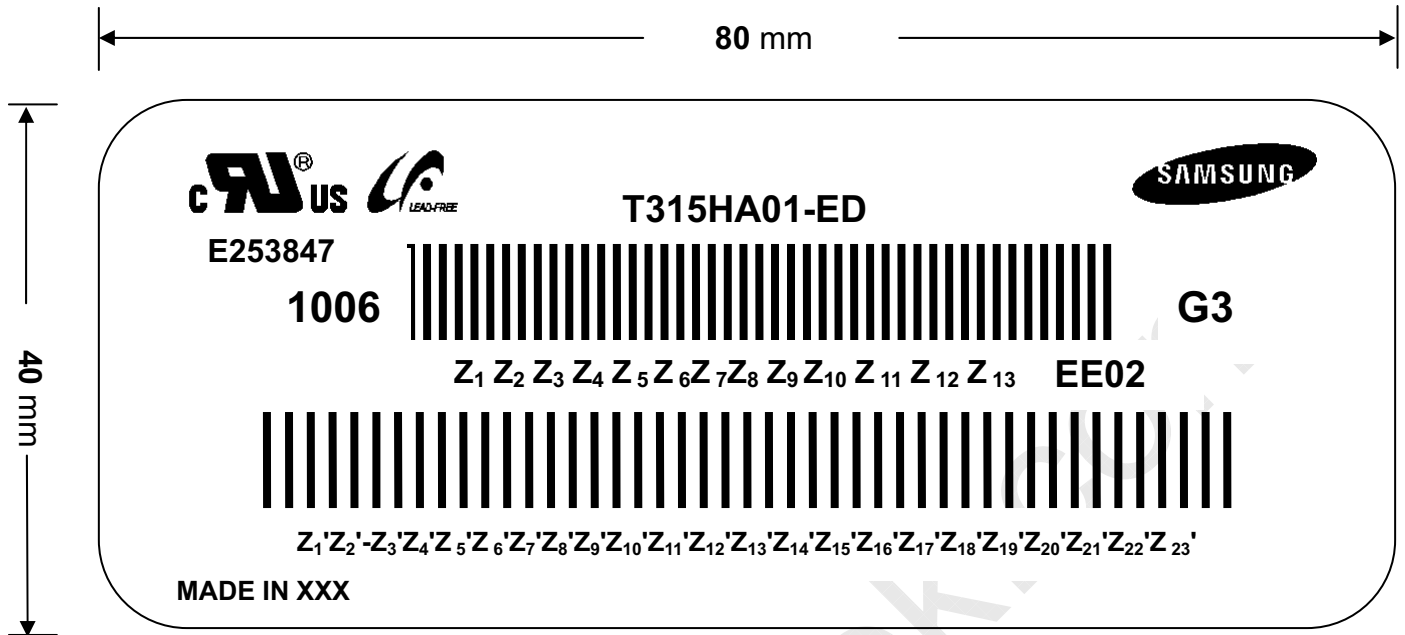
The display quality of the color TFT-LCD module should be in compliance with the Innolux's Incoming inspection standard.

G. Handling precaution

The Handling of the TFT-LCD should be in compliance with the Innolux's handling principle standard.

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H. Label**(1). Module Label**

(a) Model Number: T315HA01-ED

(b) Week Code: 1006 (YY,WK)

(c) Revision Code: EE02 (Maker information + Minor Revision)

(d) Serial ID I: Z₁ Z₂ Z₃ Z₄ Z₅ Z₆ Z₇ Z₈ Z₉ Z₁₀ Z₁₁ Z₁₂ Z₁₃

Serial No: Lot No, Panel No

Plant No.

Year, Month, Date

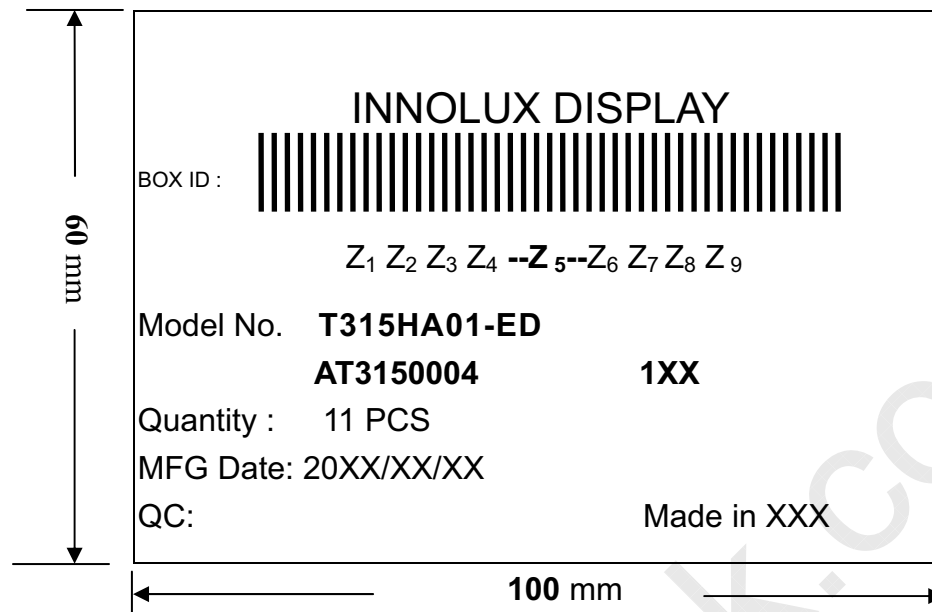
Maker information: EDEE

Customer Code: V

(e) Serial ID II : PPID (23 digits)

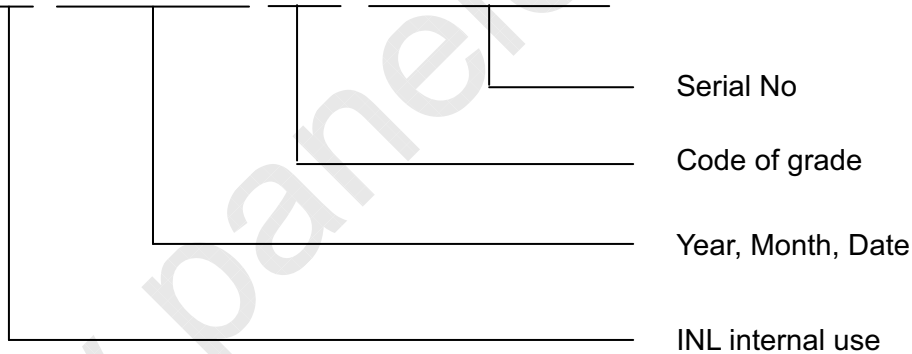
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(2) Carton Label (for INL internal shipment)

(a) Model Number: T315HA01-ED

(b) Packing quantity: 11 pcs

(c) Serial ID: Z₁ Z₂ Z₃ Z₄ Z₅ Z₆ Z₇ Z₈ Z₉

Serial ID includes the information as below:

(a) Manufactured Date: Year: 0~9, for 2000~2009

Month: 1~9 & A~C for Jan. ~Dec.

Date: 1~9 & A~Z (exclude I, O, Q, U) for 1st~31th

(b) Code of grade: 1, 3, 5, E

(c) Serial No: Module packing sequence no.

(3) Carton Label for SEC